

Rediscovery of Beck's Petrel *Pseudobulweria becki*, and other observations of tubenoses from the Bismarck archipelago, Papua New Guinea

Hadoram Shirihai

Received 31 December 2007

Beck's Petrel *Pseudobulweria becki* is considered 'maybe extinct' (Bretagnolle *et al.* 1998), 'exceedingly rare' (Brooke 2004), and is treated by BirdLife International (2004) as Critically Endangered. It is known solely from two specimens collected in 1928 and 1929, and several recent unconfirmed sight records, the validity of which were questioned by Hume & Scofield (2007). Here I announce the species' unequivocal rediscovery, including a sizeable substantial breeding population (indicated by recently fledged juveniles). I also salvaged a freshly dead fledgling at sea. I discuss first the background to the field work, then identification and behaviour of *becki*, and finally I present other interesting tubenose records made during my research.

Background and Methods

Field identification of tubenoses presents a great challenge in many parts of the world, and is the subject of a forthcoming monograph of the group (Shirihai & Bretagnolle in prep.). Particularly in recent years, I have commenced detailed research into the tropical-water species, especially those in the Pacific. My first visit to the Bismarck archipelago, in July–August 2003, was to search, successfully, for Heinroth's Shearwater *Puffinus heinrothi* (Shirihai 2004). I also observed two other interesting petrels, Beck's and Fiji Petrel *P. gillivrayi*-like birds, which inspired me to return to the area. (For details of the 2003 survey, see Shirihai 2004.) Thus, on 27 July–8 August 2007 I chartered the 24-m *FeBrina* to cover the seas between New Britain, New Ireland and Bougainville, and some small island groups further north (see Fig. 1). During the c.1,400-km voyage, with constant observation en route between 'hotspots', 'chumming' was performed for 67 hours, using four tons of grated fish remains mixed with very dense fish oil and frozen in 20-kg blocks. These were prepared by a local fish factory and were kept on board in a special freezer. By using frozen blocks, the bait floats longer, permitting petrels to take the food before it sinks. Especially *Pterodroma* and *Pseudobulweria* petrels are more easily attracted to floating material of a certain size (permitting more prolonged and closer views). I chose areas to 'chum' based on underwater topography (along contour lines and over seamounts), or close to islands with high mountains cloaked in forest, with constant cloud cover at their summits, where such petrels might be found. The petrels largely appeared to avoid the *FeBrina* and thus, when sea conditions were favourable, I used a 5-m skiff to permit closer observations and photography.

Following the 2007 voyage, I visited the American Museum of Natural History (AMNH), New York, to examine the two specimens collected by Rollo Beck and to prepare comparative morphometric data. Tissue samples from the fledgling I salvaged have been analysed by Bretagnolle *et al.* (in prep.), wherein the evolution and taxonomy of the genus *Pseudobulweria* will be discussed.

I also documented my observations of Beck's Petrel in 2007 photographically, taking images of 30+ individuals at sea, using a Canon DS1 camera with ImageStabiliser 300 and 400 mm lenses.

Survey area

The Bismarck archipelago, north-east of Papua New Guinea, represents the above-surface portion of a complex oceanic ridge that runs north-west to south-east, and is almost semi-circular, partially enclosing the Bismarck Sea, and extending south to the Solomons. Most islands are mountainous, covered by tropical forest (replaced locally by plantations), and surrounded by extensive reefs that harbour the world's highest underwater wildlife diversity. Nevertheless, as Hadden (1981), Coates (1985) and Beehler *et al.* (1986) have noted, observations on seabirds in this region have been predictably few.

Beck's Petrel and its rediscovery

The two specimens in AMNH are: a female, taken at 03°S 155°E, east of New Ireland and north of Buka, Papua New Guinea, on 6 January 1928 by Rollo Beck, the principal collector of the Whitney South Sea Expedition; the second, a male, was taken east of Rendova, Solomon Islands, on 18 May 1929, also by Beck. The species was described, in *Pterodroma*, by Murphy (1928), who in comparing it to *P. rostrata* specified that 'The size distinction being greater than any yet recognized as subspecific among petrels, I have assigned specific rank

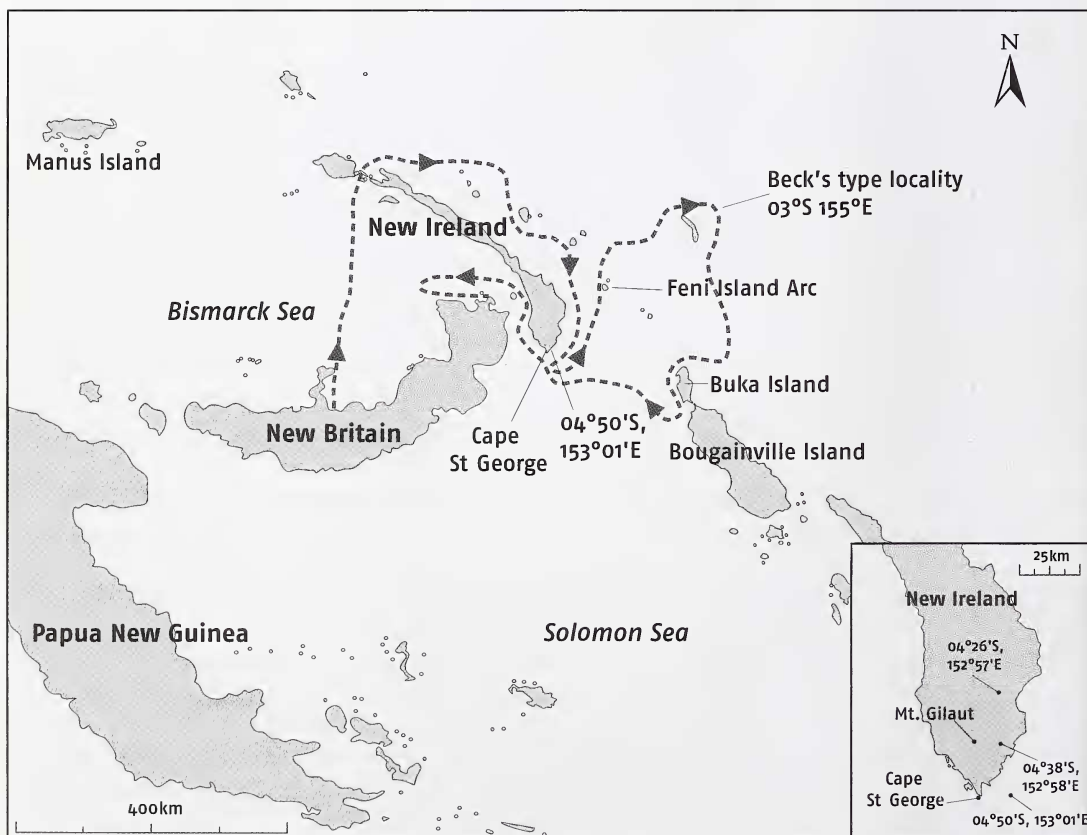


Figure 1. Map of the route followed by the *FeBrina* in July–August 2007. Departed Kimbe Bay, New Britain, on the night of 26/27 July, then partially circumnavigated New Ireland from the north-east, visiting islands to the north, including the Feni group, and the type locality, eventually reaching the northern end of Bougainville, before cruising north through St George's Channel, and off Cape Lambert; and docking at Rabaul, New Britain on 8 August. Note the Beck's Petrel 'hotspot' off Cape St George, and the montane forest ridges in southern New Ireland where Beck's Petrel might breed (bottom right).

to the new form.' He named it for Beck thus: 'It seems appropriate that the name of Rollo H. Beck, who has collected more Tubinares than any other man, should be commemorated within the group, and the receipt of this very interesting undescribed petrel gives an opportunity to pay him a well-deserved tribute.' Beck was also the first ornithologist to use 'chum' to attract tubenoses (Mearns & Mearns 1998), which method proved the key to rediscovering 'his' petrel.

Despite having positively identified Beck's Petrels in the Bismarcks in August 2003 (Shirihai 2004: see Appendix), I consider the 2007 voyage to mark the certain rediscovery of the species, due to the salvaging of a third specimen. Based only on sightings it would never be possible to prove the species' continued existence, because Beck's is fundamentally identical to Tahiti Petrel *P. rostrata*, except in size. However, in 2007, it was possible for the first time to observe Beck's and Tahiti Petrels side by side, and to establish some identification criteria for the former, as well as its abundance and behaviour. Close views revealed that many birds were post-breeding (moulting) adults or recently fledged juveniles. I also pinpointed a suspected breeding locality for Beck's Petrel based on the birds' behaviour.

My observations of Beck's Petrels in July–August 2007 were as follows (along with those Tahiti Petrels seen on the same days). *30 July*—Cape St George, southern New Ireland, at 04°50'S, 153°01'E. Two long 'chumming' sessions, in the morning and afternoon. Overall rather calm, but slightly stronger wind from mid morning to late afternoon. Totals of 20+ *becki* (max. 8 at one point/time, most being recently fledged juveniles) and six *rostrata* (two worn/moulting adults; four fresh juveniles). *31 July*—Left Cape St George at 05.00 h, but a tropical storm forced a change of direction, towards the Feni Islands. Five *becki* around the same area as the previous day and seven at 04°46'S, 153°01'E (max. 5, most apparently very fresh juveniles), and two *rostrata* (appeared evenly feathered, i.e. probably fresh juveniles) in latter locality. *3 August*—Arrived at c.06°00'S, 154°22'E, west of Buka Island, at 06.00 h, and 'chummed' until 15.00 h, at three main localities with water depths of 1,000–2,000 m. Moderate sea conditions. Three *becki* (one adult; two fresh juveniles) and five *rostrata* (one adult; rest fresh juveniles). *4 August*—Reached southern tip of New Ireland, near Cape St George, at 04°50'S, 153°01'E, at 05.30 h; 'chummed' on and off all day. Rather windy. At least 30 *becki* (max 16; mostly fresh juveniles, but some very worn/moulting adults). One freshly dead bird that had recently fledged was collected, and is now held at The Natural History Museum (NHM), Tring (BMNH 2008.1.1). Just two *rostrata* (a worn/moulting adult and a fresh juvenile). *5 August*—'Chumming' all day at 04°50'S, 153°01'E. Very calm in the morning but strong wind in the afternoon: 20+ *becki* (max 11; mostly fresh juveniles, some very worn/moulting adults) and eight *rostrata* (max 3; two worn/moulting adults and six fresh juveniles). *6 August*—'Chumming', between Cape St George and the Feni Islands, at 04°37'S, 153°10'E, 06.00–08.00 h, but no birds attracted; then moved into St George's Channel to reach off Cape Lambert. Five lone *becki*, mostly in the channel. *7 August*—'Chumming' in two locations, 06.00–08.30 h and 12.00–16.00 h, roughly off Cape Lambert. Light wind in morning, but very calm from midday. Five *becki* (two very worn adults in moult and three juveniles) at 03°54'S, 151°29'E, and seven (two very worn adults in moult and five juveniles) at 03°51'S, 151°31'E. In the first location, one *rostrata* (very worn adult in moult) and in the other two *rostrata* (a very worn adult in moult and a fresh juvenile).

In sum, Beck's Petrels were observed on seven of the 13 days of the expedition, in at least four different, well-separated localities. Thus, the species appears quite widespread in the area, albeit with Cape St George being the most favoured location. Tahiti Petrel was also present at most of the same localities, but in smaller numbers, though this might partially be explained by its tendency to keep further from the boat and / or 'chum'. *P. rostrata* also tends to congregate less than Beck's, which appears to more freely form small groups, espe-

cially at food. However, in many instances the two were seen close together, sometimes side by side at the 'chum' or when attracted to floating objects. Nevertheless, they never appeared to truly mix, and in some instances they even appeared to avoid each other. At two localities I observed Tahiti Petrels alone: two off Kimbe Bay and one off the Feni Islands (03°30'S, 154°19'E) on 27 July. Only once were there more Tahiti (five) than Beck's Petrels (three) present, on 3 August, off Buck Island. That Beck's Petrel went unknown for so long was due to its virtually identical appearance to Tahiti Petrel, but my observations suggest not only that Beck's Petrel is rather frequent in a certain sea area, but that it outnumbers Tahiti Petrel in the same region, at least seasonally.

Abundance of Beck's and Tahiti Petrels in the Bismarcks

Hadden (1981), Coates (1985), Beehler *et al.* (1986) and Marchant & Higgins (1990) all suggest that Tahiti Petrel is the most frequent gadfly petrel in the region. Marchant & Higgins (1990) also state that *becki* is known only from the two specimens and 'recent sightings' (but without details). Coates (1985, 2001), who regards Beck's as a race of Tahiti Petrel, considers the latter 'uncommon' around Papua New Guinea, including the Bismarcks and Solomons, with records in most months. Coates (1985) also mentions that '*becki* occurs in the north-east, and *rostrata* presumably in the south and probably elsewhere', though again his basis is unclear. Also included therein is a photograph of a bird trapped in Port Moresby, in May 1970, which was certainly *rostrata* based on its long wings. Coates & Swainson (1978) state that Tahiti Petrels were especially common in late February/early March 1975, between Wewak and Wuvulu. Bourne & Dixon (1971) suggested that a flock of ten birds observed by D. M. Simpson off the Wuvulu Islands, north-east of New Guinea, on 12 April 1969, may have been this species, as they were far from the known range of any similar petrel. There are also 19th century and other recent reports of petrels from this area that could have been *becki* (W. R. P. Bourne, G. Dutson and M. Imber *in litt.* 2008), but none possesses any documentation. Finally, Brooke (2004) added 'groups of up to 250 seen near the Solomons and the Bismarck Archipelago were perhaps this species (BirdLife International 2000)'. However, the origin of the record of 250 birds is a trip report, by A. Richards and R. Rowland, who counted 250+ Tahiti Petrels, between Madang and Wasu, on 16 November 1992 (Richards & Rowland 1995). Nevertheless, it is impossible to determine to what degree these past records of 'Tahiti Petrels' might include Beck's Petrel, whilst the basis for presuming that some of the earlier records from north-east New Guinea were *becki* appears to be primarily that they were made close to the type locality, as characters for separating *becki* and *rostrata* at sea were unknown until now, and it seems to have gone unappreciated that they do overlap in range. Already, c.10 years ago, M. Imber (unpubl. ms.) suggested that *becki* might be found in the Bismarcks and Solomons, and speculated that some published records of *rostrata* might actually pertain to *becki*, but he also stated 'there is a need to examine one or more in the hand so that this can be determined'.

Given my 2007 findings, it remains impossible to be sure whether past records of Tahiti Petrel were actually Beck's Petrel, but the fact that I found *becki* more abundant locally than *rostrata*, and that their at-sea separation was unknown, it seems probable that some (perhaps even most) previous records of Tahiti Petrel involved Beck's.

There is no correlation between daily numbers of the two species but, at least off Cape St George, Beck's is distinctly more abundant and regular than Tahiti (80–90% of the total numbers observed), and at this locality my impression is that Tahiti Petrels are perhaps mostly transiting the area. Cape St George was also the site of my 2003 observation of Beck's (Shirihihi 2004; see Appendix), and the same day I also recorded 20 Tahiti Petrels, but these were mostly further south and offshore.

It is interesting to speculate whether only Beck's Petrel breeds in this region and, if so, to understand the origin of those Tahiti Petrels seen in the area. If both species breed there, do they segregate, or breed in mixed colonies? My 2007 observations suggest that they have rather parallel moult and, thus, perhaps breeding cycles. However, this alone cannot serve as indication that both breed in the region, and this question is one that particularly demands further and more detailed investigation.

Where does Beck's Petrel breed?

Beck's Petrel is probably nocturnal at the nesting sites and thus difficult to find, especially given that numerous potential breeding sites on atolls and islands exist. Brooke (2004) described the distribution of Beck's as presumably seas around the Solomons and generally north-east of Papua New Guinea, whilst Bourne (1965) speculated that higher hills in the Solomons represent a possible nesting locality. I would also highlight the following possibilities. J. Diamond (*Auk* 99: 821), in his review of Hadden (1981), wrote that that on Bougainville, including Mt Balbi, local villagers know of a dark bird the size of a small duck that apparently lives in burrows and whose local name, 'kikariko', derives from its voice. However, M. Imber (*in litt.* 2008) suggests that the vocalisations and behaviour of these birds appear to better fit a small shearwater than a petrel.

During 2007 I visited the type locality, at 03°S 155°E, very close to the flattish coralline Nuguria Islands, but failed to find Beck's Petrel in the area and the islands appeared unsuitable for burrow-nesting petrels. North of New Ireland I also failed to find Beck's Petrel, except seven birds south of the Feni Islands. Of all the islands north of New Ireland, the main island in the Feni group is the only one with substantial montane forest. No petrels were seen visiting the island at dusk on 1 August and native people confirmed that they have never seen such birds there. Nevertheless, close to Cape St George, I found a concentration of Beck's Petrels particularly close to land, involving recently fledged juveniles and a few moulting adults. Especially the adults came very close inshore in the early morning and, particularly in late afternoon and evening, sometimes even to within 1.5 km. Together with the discovery in the same locality of the freshly dead fledgling (with still a few single remnant downy feathers on the crown and chest), it seems plausible that *becki* breeds in the nearby montane forests of southern New Ireland, e.g. around Mt Gilaut (c.2,400 m) at 04°37'S, 152°52'E, around the peaks further east at 04°38'S, 152°58'E, and north at c.04°26'S, 152°57'E, including the Hans Meyer Range (max. c.2,400 m).

Conservation

Like other tubenoses, Beck's Petrel is potentially threatened by introduced cats and rats at its breeding sites, although until these have been identified this possibility remains speculative. A more germane threat to any breeding petrels in this region, and to the land avifauna, is mass logging and clearance for oil-palm plantations, especially by foreign companies and particularly in New Britain (Buchanan *et al.* 2008). International and regional conservation bodies must act in order to protect forests in the Bismarcks and elsewhere in New Guinea.

Description

Beck's Petrel is essentially a miniature version of Tahiti Petrel. Here I describe its characters and compare them with those of Tahiti Petrel.

Size, proportions and flight.—Measurements of the freshly dead *becki* collected on 4 August 2007 are compared with the two *becki* collected in 1928–29 in Table 1 (see also Fig. 3).

TABLE 1

Measurements (mm) of Beck's Petrel *Pseudobulweria becki* (three, the NHM bird measured prior to specimen preparation, by HS), and Tahiti Petrel *P. rostrata* (nominate and *trouessarti*, after Villard *et al.* 2006).

	<i>Pseudobulweria becki</i>			<i>Pseudobulweria rostrata</i>			
	BMNH 2008.1.1 4 August 2007	AMNH 235376 type, ♀ 6 January 1928	AMNH 220826 ♂ 18 May 1929	<i>Rostrata</i> Polynesia–Marquesas (skins) range; mean ± sd		<i>trouessarti</i> New Caledonia (alive) range; mean ± sd	
				♂♂ (n=15)	♀♀ (n=14)	♂♂ (n=31)	♀♀ (n=29)
Wing	R 251; L 250	R 244; L 243	R 240; L 242	278–307 297.0 ± 8.4	285–308 294.4 ± 6.0	274–318 302.4 ± 7.5	282–318 297.5 ± 8.6
Tail	100	98	99.3	114–130 119.8 ± 4.3	115–128 120.2 ± 4.1	114–133 122.5 ± 4.0	113–128 120.4 ± 4.5
Bill	29	25.3	27.2	33.7–38.2 36.2 ± 1.0	33.1–37.4 35.4 ± 1.2	35.2–39.9 37.4 ± 1.2	32. 25–39.6 35.4 ± 1.3
Bill depth (at base of nostril)	15	12	14.5				
Bill depth (at gonys)	13	11.6	11.5	13.2–15.4 14.6 ± 0.6	12.9–15.0 13.9 ± 0.5	12.7–16.5 15.4 ± 0.6	13.5–15.45 14.4 ± 0.49
Tarsus	39.5	36.5	38.2	43.3–50.2 47.9 ± 2.0	43.4–51.0 47.4 ± 2.1	47.2–52.95 50.2 ± 1.4	45.8–50.85 48.7 ± 1.17
Moult and wear	Very fresh, and evenly feathered juvenile	Evenly feathered remiges and coverts, and generally quite fresh or slightly worn, suggesting a few months old juvenile	Evenly feathered remiges and coverts, and generally quite worn and bleached, suggesting almost one year old juvenile				

Measurements of the three are clearly complementary, with no apparent overlap between them and published measurements of either race of *rostrata*. Moreover, the former is smaller by c.15% in wing and tail measurements, but even smaller (c.25%) in bill and tarsus lengths. During August 2007 I observed Beck's and Tahiti Petrels side by side and, in such situations, the former appears 10–20% smaller with a shorter wingspan. Proportionately, Beck's also appears narrower winged. I measured the wingspan of the fresh juvenile several times (by stretching the wings, but not to their absolute maximum), achieving a mean of 84 cm. I have never measured the wingspan of live or freshly dead Tahiti Petrels, but it is interesting to note that Harrison (1983) (and apparently all subsequent authors, e.g. Marchant & Higgins 1990, Doughty *et al.* 1999, Onley & Scofield 2007) gives a wingspan of 84 cm for Tahiti Petrel, which appears far too short. My impression is that Tahiti's wingspan is probably only slightly shorter than those of White-necked Petrel *Pterodroma cervicalis* and Wedge-tailed Shearwater *Puffinus pacificus*. M. Carter & P. Walbridge (*in litt.* 2008) estimate the wingspan of Tahiti Petrel as c.1 m (based on two specimens and birds photographed at sea off Australia). Beck's is usually visibly (often obviously) shorter winged than all the latter three species (in direct comparison), and the wingspan appears similar to those of Mottled *Pterodroma inexpectata* and Soft-plumaged Petrels *P. mollis*, or even Phoenix Petrel *P. alba*, or perhaps midway between Black-winged *P. nigripennis* and Tahiti Petrels.

Doughty *et al.* (1999) and Onley & Scofield (2007) described the bill of Beck's as being 'proportionately smaller' or 'less robust' than that of Tahiti, but the bill of Beck's is still relatively deep-based though distinctly shorter (see Table 1). Thus, in relation to overall size,



Figure 2a. Recently fledged juvenile Beck's Petrel *Pseudobulweria becki*, off Cape St George, New Ireland, Papua New Guinea, August 2007, showing the slighter and slimmer body than Tahiti Petrel *P. rostrata* (note the long/slender wings and elongated body); otherwise the two are virtually identical in shape and are identical in plumage. Note the evenly very fresh wing-feathers and mostly dark underwing-coverts (as in some populations of Tahiti Petrel *P. rostrata*, the underwing-coverts become whiter with age, forming a variable white band) (Hadoram Shirihi)



Figure 2b. Beck's Petrel *Pseudobulweria becki*, off Cape St George, New Ireland, Papua New Guinea, August 2007: note the paler uppertail-coverts, similar to Tahiti Petrel *P. rostrata*, which in both species vary individually and with wear and bleaching; apparently an adult or immature due to appearance of some moult limits and feather bleaching (Hadoram Shirihi)



Figure 3. Comparison of the bill dimensions of Beck's *Pseudobulweria becki* (top) and Tahiti Petrels *P. rostrata*. Such distinctive differences in bill size support specific status for *becki*, but the field observer should bear in mind that these differences are not easily appreciated at sea. Specimens at AMNH, New York (Hadoram Shirihai)



Figure 4a. Fresh juvenile Matsudaira's Storm Petrel *Oceanodroma matsudairae*, off Cape St George, New Ireland, Papua New Guinea. August 2007 (Hadoram Shirihai)



Figure 4b. Adult Matsudaira's Storm Petrel *Oceanodroma matsudairae* in extensive post-nuptial moult of the tail and flight-feathers, off New Ireland, Papua New Guinea. August 2007 (Hadoram Shirihai)

Beck's appears to have a rather bulbous bill, which can seem confusingly 'massive' at sea (see Fig. 2).

Jizz and flight.—Beck's shares many structural characters, flight modes and behaviour with *rostrata*. Both possess an elongated body, long tapering tail, long neck but relatively small head, and bulbous bill. Both fly on long, narrow wings that, when gliding into the wind, tend to be held rather stiff and seemingly straight, but which in head-on or back views can be seen to be held in a shallow arc. Both have characteristic 'relaxed' wingbeats, but due to its shorter and narrower winged appearance, in Beck's the looser, languid and more elastic wingbeats appear more pronounced, sometimes even bringing to mind the display-flight of Ringed Plover *Charadrius hiaticula*. Beck's also appears plumper bodied than Tahiti. In some instances, Beck's has clearly more rapid wingbeats and shorter, more swooping glides, sometimes with more erratic changes of direction, whilst when arcing/banking these actions are often distinctly shorter and steeper, almost like a mid-sized *Pterodroma* petrel. In comparison, especially larger and heavier individuals of Tahiti Petrel are clearly stronger built, fly on longer and stiffer wings, with much gliding and long arcs, at greater speed, thereby affording an almost miniature albatross-like impression. Furthermore, both in 2003 and 2007, I observed Beck's in very calm conditions flapping their wings very rapidly, almost like *Cookilaria* petrels, or even a large storm petrel (or marsh tern flying close to the surface), especially around floating objects.

Even for an experienced seabird observer, it can require time, practice and, especially, direct comparisons to appreciate the structural and flight differences between Tahiti and Beck's Petrels. However, once these are learned, it can be rather straightforward to correctly identify many birds. Nevertheless, the following pitfalls demand mention. (1) Tahiti Petrel can appear misleadingly smaller and sligher, like Beck's, whilst geographical variation in size across the range of *rostrata* is poorly known due to the lack of specimens. It is important to note that populations of Tahiti Petrel do vary, even quite substantially, in size, with some populations being smaller and shorter winged (Bretagnolle & Shirihai in prep.). In consequence, sometimes the two species can be less appreciably different in size. Also, as in other petrels, bear in mind that individual and sexual size differences (Bretagnolle & Shirihai in prep.) could obscure differences between taxa (e.g. a larger male Beck's and smaller female Tahiti could differ less distinctly in size at sea). Fortunately, at least in the Bismarcks, the slightly larger race *trouessarti* of Tahiti can be more obvious to eliminate on size. (2) Also bear in mind the enormous effects of wind strength and direction on flight mode, as well as the bird's behaviour, e.g. if the bird is in direct flight or foraging, which all affect a bird's apparent size and shape. Thus, in certain circumstances, the flight of Beck's can appear slower and heavier, and the bird seem confusingly larger. On the other hand, a smaller Tahiti Petrel when feeding or flapping over a floating object can appear misleadingly smaller, and closer to Beck's.

Plumage.—A BirdLife International press release (www.birdlife.org/news/news/2006/06/beck_petrel.html) claimed that *becki* differs from *rostrata* in having a paler throat or whiter underwing-coverts (based on R. Baxter's claim; see Appendix). This is incorrect. Beck's and Tahiti Petrels are identical in plumage and both appear to vary similarly with age and wear (though see below). Both possess a uniform dark sooty-brown hood reaching to the breast and sharply demarcated from the white underparts, as well as, often, a variable paler brown transition on the lower breast (Fig. 2). The latter can appear more pronounced and frequent in Beck's, but there is much overlap. The upperparts, including wings, back and tail, are very dark brown to almost blackish brown, whilst the uppertail-coverts are variably paler. The vent, basal and central undertail-coverts are mostly white, but the outer

coverts and their tips are always washed brown. Variable brown smudges on the body-sides and, especially, upper flanks, often merge broadly with the brown breast. The underwings of Beck's (as in some/most Tahiti populations) vary from uniform blackish brown to having a pale central area.

My observations of Beck's in the Bismarcks, and Tahiti Petrel there and elsewhere in the Pacific, suggest that both vary in similar ways with age and feather wear. The underwing-coverts of juvenile Beck's are initially mainly dark, without or with only a limited pale wash to the edges of the coverts on the central underwing, whilst adults develop broader and whiter feather centres which, due to wear and bleaching, form a large central belt across the underwing (subject to much individual variation). This also seems true of some/most populations of *rostrata*, but variation (both age-related and geographical) in the underwing-coverts of Tahiti is subject to ongoing study (Bretagnolle & Shirihai in prep.).

In both Beck's and Tahiti the paler uppertail-coverts are most obvious in worn plumage and appear most pronounced in adults/immatures (much less so in fresh juveniles). In August 2007 two main moult types were evident in both species: evenly fresh-feathered juveniles, and adults in different stages of feather wear and post-nuptial moult of body-, tail- and flight-feathers. This suggests that both species have rather parallel moult cycles, and thus feather wear and moult pattern cannot be used to distinguish them. Extremely worn adults, of both species, show some exposed white basal feathers on the upperwing and a pale central throat/breast area, as well as often-obvious moult limits and gaps in the wings.

Bare parts.—Both species have the bill and irides blackish, whilst at sea the feet and tarsi in close views may appear predominantly pinkish or dull flesh-coloured. The tarsi of the fresh juvenile Beck's were mostly bluish-pink with a dark brownish-black outer side; the feet and webs were mainly dark brownish black with a pinkish lower base and basal corner to the inner web (forming an oval patch). No Tahiti Petrels at the same stage have been examined for comparison.

Final remarks.—To positively identify Beck's Petrel, attempt to compare the bird/s in question with other petrels and shearwaters in the vicinity, preferably with Tahiti Petrel. With experience, it should be possible to reliably identify the distinctly smaller and lighter built Beck's from the larger Tahiti Petrel, especially in the Bismarcks. Suspected Beck's Petrels away from the core range will be extremely difficult to prove (see Appendix), unless directly and closely compared with Tahiti Petrel, and preferably well photographed. The occurrence of smaller Tahiti Petrels must also be kept in mind. Thus, only if obvious overall size differences and the shorter but relatively stubbier bill of Beck's are evident will certain identification be possible. Few medium-sized white-bellied gadfly petrels might be confused with Beck's (and Tahiti) Petrels, e.g. Phoenix Petrel, but these are readily distinguished, if seen well, by plumage characteristics and shape (e.g. Phoenix has a diagnostic whitish leading edge to the underwing).

Foraging behaviour and response to boat

Beck's Petrel differs from *rostrata* in several respects. Whilst both are generally rather shy of boats (i.e. usually avoiding or only briefly investigating them), and rarely follow boats for extended periods, unlike, e.g., Providence *Pterodroma solandri* and Murphy's Petrels *P. ultima*, Beck's Petrel to some degree is more tolerant of vessels. It was observed to approach the bows closer and, perhaps, more frequently than Tahiti whilst transiting the area, but still only briefly. When the *FeBrina* was stationary at 'chum' far greater numbers of Beck's came to investigate (four of ten birds) than Tahiti Petrels (1/10). In most instances Beck's still

tended to keep at least 300 m distant from the boat, but Tahiti remained even further away and made briefer and more 'hesitant' approaches. In response to the skiff more obvious differences between the two were observed: Beck's was noticeably more attracted to the 'chum', sometimes coming just a few metres from the skiff, whereas Tahiti always maintained at least c.50 m from the boat. Beck's was observed to remain at the 'chum' for an average 1–2 minutes (sometimes five minutes), and often patrolled the slick several times, but Tahiti usually checked the 'chum' more briefly and directly (without the zigzagging flight of Beck's). Thus, at least in the Bismarcks and at this season, Beck's seems to better tolerate boats and to be more attracted to 'chum' than Tahiti. Both, however, have a similar feeding technique, collecting food from the surface in flight. It should be emphasised that these behavioural differences are related to a specific time and locality, and should not be used to support identification. It is probable that elsewhere and in other circumstances the two species will behave differently. For instance, off Southport, Queensland, Tahiti Petrels are highly attracted to shark liver (but not other 'chum'), when they sometimes approach to within 1 m of a large boat, even flying over the deck (M. Carter *in litt.* 2008).

Systematics and taxonomy

The present work has elucidated evidence that *becki* and *rostrata* differ considerably in size and behaviour at sea, and that *becki* appears to warrant specific status. Some authors (e.g. Brooke 2004, Onley & Scofield 2007) recently considered *becki* to be a separate species, but this was not based on analyses of DNA or biology. Bretagnolle *et al.* are currently examining the molecular characteristics of the two.

Fiji-like Petrel

Both in 2003 and 2007 I observed dark Fiji Petrel *Pseudobulweria macgillivrayi*-like birds in the Bismarcks, as follows: 2003—One, on 14 August, off Kimbe Bay, New Britain, Papua New Guinea (Shirihai 2004). 2007—One, on 31 July, between the southern end of New Ireland and the Feni Islands (c.04°20'S, 153°18'E), with a similar bird, also on 7 August, off Cape Lambert (at 03°51'S, 151°31'E), which investigated the 'chum' for two minutes at the same time as two Beck's Petrels.

All three birds had a similar structure to *Pseudobulweria* petrels, especially Beck's in shape, but two birds seemed to be slightly smaller overall, despite appearing to have a more robust body, larger head and heavier bill, more rounded wings, and shorter and squarer tail. At certain angles, overall jizz and flight silhouette approached those of *Bulweria* petrels. Their plumage was predominantly or uniformly dark chocolate-brown, with a slightly darker head or face, no, or only a fractionally paler, upper wingbar (in one, slightly paler secondary-coverts were seen, perhaps attributable to feather wear). The basal remiges and larger wing-coverts from below were tinged greyer (rather obvious in sunlight).

Mainly due to the lack of comparative photographic references or even a description of the species' appearance and behaviour at sea, I regard these records as uncertain for now, especially as these birds could even represent an undescribed *Pseudobulweria*. Another suspected Fiji Petrel was observed, on 12 April 2007, north of Bougainville, at c.01°50'S, 153°59'E (S. N. G. Howell pers. comm.; www.wildwings.co.uk), but no detailed description is presently available of this bird.

Fiji Petrel was discovered by Dr F. M. Rayner aboard the *Herald*, at Gau in October 1855, and was described by G. R. Gray, in honour of the expedition's other naturalist, John MacGillivray. The species went unrecorded until 1985, when Dick Watling captured an adult and a fledgling on Gau (Watling & Lewanavanua 1985). Since then, there have been several more records from the same island, mostly of birds attracted to lights at night (D.

Watling pers. comm.). Thus, other than my putative records from the Bismarcks, this petrel is known solely from Fiji. However, further research might easily prove these birds to be regular in the Bismarcks (given the extremely limited attention devoted to pelagic species in the archipelago to date), and I will be returning there in 2008 to try and relocate these birds.

Other possible new tubenoses for Papua New Guinea waters

Providence Petrel *Pterodroma solandri* One on 4 August 2003, c.17 km off Buka Island, Bougainville (Shirihai 2004), apparently is the first record for Papua New Guinea (Beehler *et al.* 1986, Coates 1985, 2001). Given that it breeds relatively close by, principally on Lord Howe Island, and is at least a partial transequatorial migrant (Brooke 2004), the species has probably been overlooked previously in the area and might well prove to be regular in the Bismarcks.

Christmas Shearwater *Puffinus nativitatis* One off the Feni Islands (at 03°45'S, 153°50'E), on 1 August 2007, is apparently the first record for Papua New Guinea (Beehler *et al.* 1986, Coates 1985, 2001). Given that the species breeds reasonably close by in the central Pacific, it is again unsurprising that it should occur in the Bismarcks.

Matsudaira's Storm Petrel *Oceanodroma matsudairae* During 13 days at sea in July–August 2007, the species was identified and photographed (Fig. 4) on seven days at well-separated localities, as follows. 28 July.—Off New Ireland, at 02°23'S, 150°52'E, five adults in extensive moult, especially their primaries (most with gaps in the remiges and a few old outer primaries and broken tail-feathers). 29 July.—Off New Ireland, at 02°17'S, 152°04'E, three adults in extensive moult (as above). 30 July.—Near Cape St George, at 04°50'S, 153°01'E, a fresh juvenile. 1 August.—Off the Nuguria Islands, one at 03°36'S, 153°58'E and another at 03°28'S, 154°27'E. 2 August.—East of the Nugurias, four observed (some adults in moult). 3 August.—West of Buka Island, north of Bougainville, in waters 1,000–2,000 m deep, 12, with max. 4 at one location, all adults in moult. 7 August.—Off Cape Lambert, at c.03°51'S, 151°31'E, a fresh juvenile. Matsudaira's Storm Petrel is apparently unrecorded in Papua New Guinea's waters (Beehler *et al.* 1986, Coates 1985, 2001), although Bourne (1998) mentions a report of two large dark storm petrels, thought to be this species, seen between Manus and New Guinea, on 6 August 1997. With up to 12 birds at one locality, the species is apparently not rare here, albeit perhaps only seasonally. My observations might seem unsurprising, given the chronic lack of previous work on pelagic seabirds in this region. Nevertheless, in August 2003 I did not see any Matsudaira's Storm Petrels in the area, so the numbers in July–August 2007 might be exceptional. The migrations of *O. matsudairae* are not well known (Brooke 2004), especially its at-sea range during post-breeding and moulting dispersal, making my observations of especial interest. However, it does appear quite likely to be found on migration in August in the region, en route to its Indian Ocean winter quarters, having been recorded around Wallace's Line and south to north-west Australia (Bailey *et al.* 1968, Brooke 2004).

Acknowledgements

To Hans Jornvall, especially, for supporting the planning of the voyage in 2007, as well as proffering encouragement and practical ideas concerning this and other similar voyages we have made in many of the world's oceans. The owners of the *FeBrina*, Max Benjamin and Cheryll & Alan Raabe, made enormous logistical preparations for the trip; without their enthusiasm and understanding, as well as that of the crew, my work would never have been so successful. Robert Prŷs-Jones (NHM, Tring), Max Benjamin and Alan Raabe effected the transfer of the dead juvenile Beck's Petrel to NHM, and Robert Prŷs-Jones also assisted with references. Paul Sweet and Margaret Hart (AMNH) assisted my examination of petrels at that institution. Vincent Bretagnolle provided useful discussions prior to this paper's submission and helped locate some important references. Stuart Butchart, Christine Alder and

Kerry Start (all BirdLife International), as well as Guy Dutson, Walter Boles, Tony Pym and Alison Harding helped with references and records of petrels from New Guinea. Guy Dutson also commented on the manuscript. Bill Bourne and Mike Imber provided many useful comments and ideas for improving the paper. Mike Carter kindly sent comments on identification and, together with P. Walbridge, provided notes about wingspan of Tahiti Petrel. Tony Palliser shared his observations from the Bismarcks and, as always, was very encouraging. Steve Howell and John Brodie-Good shared their observations from 'The Western Pacific Odyssey 2007'. Guy Kirwan made many constructive editorial comments and improvements. Finally, I would like to dedicate the rediscovery of *P. becki* to Bill Bourne, in recognition of his enormous contribution to our knowledge of the life histories and taxonomy of petrels, as well as his 'The Missing Petrels' paper, which urged continued hope for the feared 'lost' species. I, for one, will continue searching for the 'missing petrels'.

References:

- Bailey, R. S., Pocklington, R. & Willis, P. R. 1968. Storm-petrels in the Indian Ocean. *Ibis* 110: 27–34.
- Beehler, B. M., Pratt, H. D. & Zimmerman, D. A. 1986. *Birds of New Guinea*. Princeton Univ. Press.
- BirdLife International. 2004. *Threatened birds of the world 2004*. CD-ROM. BirdLife International, Cambridge, UK.
- Bourne, W. R. P. 1965. The missing petrels. *Bull. Brit. Orn. Cl.* 85: 97–105.
- Bourne, W. R. P. 1998. Observations of seabirds. *Sea Swallow* 47: 23–36.
- Bourne, W. R. P. & Dixon, T. J. 1971. Observations of sea birds 1967–1969. *Sea Swallow* 22: 29–60.
- Bretagnolle, V., Attié, C. & Pasquet, E. 1998. Cytochrome-b evidence for validity and phylogenetic relationships of *Pseudobulweria* and *Bulweria* (Procellariidae). *Auk* 115: 188–195.
- Bretagnolle, V. & Shirihai, H. In prep. Variation in Tahiti Petrels.
- Brooke, M. 2004. *Albatrosses and petrels across the world*. Oxford Univ. Press.
- Buchanan, G. M., Butchart, S. H. M., Dutson, G., Pilgrim, J. D., Steininger, M. K., Bishop, K. D. & Mayaux, P. 2008. Using remote sensing to inform conservation status assessment: estimates of recent deforestation rates on New Britain and the impacts upon endemic birds. *Biol. Conserv.* 141: 56–66.
- Coates, B. J. 1985. *The birds of Papua New Guinea*, vol. 1. Dove Publications, Alderley.
- Coates, B. J. 2001. *Birds of Papua New Guinea and the Bismarck Archipelago: a photographic guide*. Dove Publications, Alderley.
- Coates, B. J. & Swainson, G. W. 1978. Notes on the birds of Wuvulu Island. *PNG Bird Soc. Newsletter* 145: 8–10.
- Doughty, C., Day, N. & Plant, A. 1999. *Birds of the Solomons, Vanuatu and New Caledonia*. Christopher Helm, London.
- Hadden, D. 1981. *Birds of the northern Solomons*. Wau Ecology Institute Handbook 8.
- Hadden, D. 1987. Adventures in Papua New Guinea. *OSNZ News* 6: 2.
- Harrison, P. 1983. *Seabirds: an identification guide*. Croom Helm, Beckenham.
- Marchant, S. & Higgins, P. J. (eds.) 1990. *Handbook of Australian, New Zealand and Antarctic birds*, vol. 1. Oxford Univ. Press.
- Means, B. & Mearns, R. 1998. *The bird collectors*. Academic Press, London.
- Murphy, R. C. 1928. Birds collected during the Whitney South Sea Expedition. IV. *Amer. Mus. Novit.* 322.
- Palliser, T. 1987. Papua New Guinea. Report on a birding trip July–December 1987. Unpubl.
- Onley, D. & Scofield, P. 2007. *Field guide to the albatrosses, petrels and shearwaters of the world*. Christopher Helm, London.
- Richards, A. & Rowland, R. 1995. List of birds recorded in Papua New Guinea during the period 16 October to 29 November 1992. *Muruk* 7: 75–95.
- Shirihai, H. 2004. Voyage of discovery. *Birdwatch* 143: 36–39.
- Shirihai, H. & Bretagnolle, V. In prep. *Albatrosses, petrels and shearwaters of the world: a handbook to their taxonomy, identification, ecology and conservation*. Christopher Helm, London.
- Watling, D. & Lewanavanua, R. F. 1985. A note to record the continuing survival of the Fiji (MacGillivray's) Petrel *Pseudobulweria macgillivrayi*. *Ibis* 127: 230–233.
- Villard, P., Dano, S. & Bretagnolle, V. 2006. First data on the breeding biology of the Tahiti Petrel *Pseudobulweria rostrata*. *Ibis* 148: 285–291.

Address: E-mail: albatross_shirihai@hotmail.com

Appendix: Other claimed records of Beck's Petrels.

1. Recent undocumented records of 'possible Beck's Petrel' from the Bismarcks

December 1987.—One, possibly this species, seen by T. Palliser (in Shirihai 2004), on 28 December 1987, c.2 nm off Cape St George, New Ireland. One of six Tahiti Petrels mentioned by Palliser (1987) in his unpublished trip report. Initially, on checking TP's field notes, I strongly suspected that this bird was a Beck's Petrel. However, it has never been claimed by the observer as a Beck's and T. Palliser (pers. comm.) requests that it should be regarded as

'Tahiti/Beck's' or possible 'Beck's'. It was not observed with another species to permit an accurate size comparison, thus the record should be treated as 'unconfirmed' or 'possible' Beck's Petrel.

August 2003.—Three Beck's Petrels, on 5 August 2003, 2–6 nm off Cape St George, New Ireland (Shirihihi 2004), were observed in very good conditions, once even from just 100 m (a concise description can be found in Shirihihi 2004). Initially, I identified them as Beck's Petrels, mainly based on their size and different flight behaviour, compared to the few Tahiti Petrels observed simultaneously. However, I published the record (Shirihihi 2004) as 'possible Beck's' because I could not compare my observation with any others, leading me to be cautious. That these three were observed in the same place as some of my August 2007 observations strongly suggests that they were indeed *becki*, but I still prefer to regard the observations reported in this paper as constituting the official rediscovery of the species.

April 2007.—'A small, short-winged Tahiti-type off the west coast of Bougainville, Papua New Guinea, on 11 April was strongly suspected to be this species' (J. Brodie-Good & A. Roadhouse; www.wildwings.co.uk). JB-G wrote in the voyage diary: 'A few minutes later a more urgent shout "possibie Beck's Petrel on the sea ahead!" From the bridge you could see [it] settled on the water ahead but [. . .] it was a long way away. [. . .] It got up and flew [. . .] away with a number of people getting very excited [. . .]. For me and many others it was simply just too far away to call such a major bird [. . .]. During the last hour of the day at least two Tahitis were seen and three Tahiti-types [which] did appear to be shorter winged and flying like shearwaters but with such little wind it was far from easy to be conclusive. [. . .] it seemed the bird just as we stopped was [. . .] the strongest claim but I feel some caution is required [. . .]. It was distant and when pressed for a written description the next morning a number of the observers concerned "backed down" somewhat. The relative size comparison with a noddy seemed to be the main crux but Brown Noddy and Tahiti Petrel have the same wingspan and Beck's is only supposed to be 15% shorter. At the distance and intense light, with almost no wind, it's a very subjective call, certainly far from enough to get a record past a rarities committee [. . .] (Steve Howell is still adamant about this bird)'. I find it useful to quote these words as they precisely illustrate the challenge that even highly experienced observers can encounter when trying to separate Beck's and Tahiti. Nevertheless, in May 2007, S. Howell (pers. comm.) provided me with a brief verbal impression of the bird, which appeared noticeably small and slight, and sounded convincing for Beck's (the locality is also close to where I found Beck's frequently in August 2007).

2. Recent claimed record outside the Bismarcks

R. Baxter submitted a description and photograph to the 'Birds Australia Rarities Committee' of a bird believed to be a Beck's Petrel in Australia's Coral Sea, off Queensland, on 7 November 2005 (<http://users.bigpond.net.au/palliser/barc/SUMM489.htm>). However the record was not accepted as the committee felt that it was impossible to truly ascertain size and structure from the photograph. It is very difficult, and often impossible, to gain a true impression of size and structure from a single photograph, especially if the bird is distant and the photograph is not the best quality. Furthermore, two issues support non-acceptance, namely that RB was unable to directly compare his bird with *rostrata*, and that he rather strongly based his identification on the pale throat. It is now clear that this character is invalid (see Plumage). Given that I have found, in both the western and central Pacific, smaller Tahiti Petrels, and that variation within the latter is subject to ongoing research (Bretagnolle & Shirihihi in prep.), much caution is required to claim Beck's outside its core range.

© British Ornithologists' Club 2008

Editor's note.—Like Whitney's (*Bull. Brit. Orn. Cl.* 125: 108–113) first field observations of the almost unknown in life and globally threatened Rondônia Bushbird *Clytoctantes atrogularis*, Shirihihi's unequivocal rediscovery of the arguably even poorer known *Pseudobulweria becki* has been fast-tracked for publication, in the belief that swift communication and dissemination of such findings are particularly important for the conservation of 'lost' birds. *Bull. Brit. Orn. Cl.* will continue to prioritise publication of such rediscoveries in the future, subject to the usual constraints of the refereeing process.